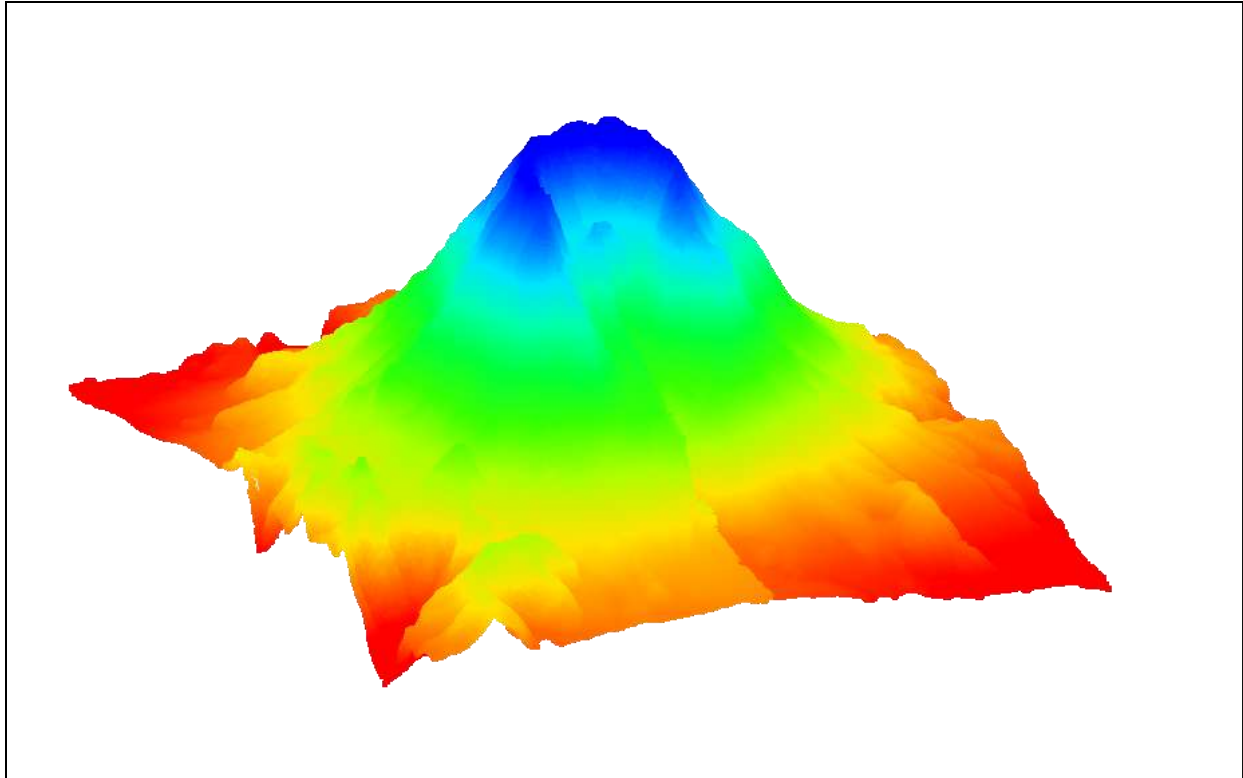


SMS 13.1 Tutorial

Lidar with Multiple Files



Objectives

This tutorial teaches how multiple lidar files can be used in SMS for display and interpolation to rasters and UGrids.

Prerequisites

- Overview Tutorial
- Lidar Tutorial

Requirements

- GIS Module
- Map Module
- UGrid Module

Time

- 10–20 minutes

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1 Introduction

Lidar is often used to conduct elevation and shallow bathymetric surveys that can be saved as point clouds or rasters. These can then be imported into SMS for use in various projects. If multiple lidar files are loaded into SMS, they can all be used to create rasters and to be interpolated to UGrids. They can also be merged together for convenience.

For discussion of the basic lidar interface in SMS, please refer to the “Lidar” tutorial. It is recommended that tutorial be completed prior to this tutorial.

1.1 Getting Started


Do the following to get started:

1. If necessary, launch SMS.
2. If SMS is already running, select *File / New* to ensure that the program settings are restored to their default state.

2 Importing Multiple Lidar Files

Begin by opening four lidar files containing data from Mount St. Helens, a volcano that erupted violently in 1980 in the state of Washington in the United States.

Open the four files by doing the following:

1. Click **Open**  to bring up the *Open* dialog.
2. Browse to the *data files* directory for this tutorial.
3. Select “All Files (*.*)” from the *Files of type* drop-down.
4. While pressing the *Ctrl* key, select “mounnelst.las”, “mounnwlst.las”, “mounselst.las,” and “mounnswlst.las.”
5. Click **Open** to close the *Open* dialog and import the files.

After several seconds, the Graphics Window should appear similar to Figure 1. By default SMS displays a maximum of 50,000 points per lidar file, so 200,000 points are being drawn. The total number of points is over 23 million.

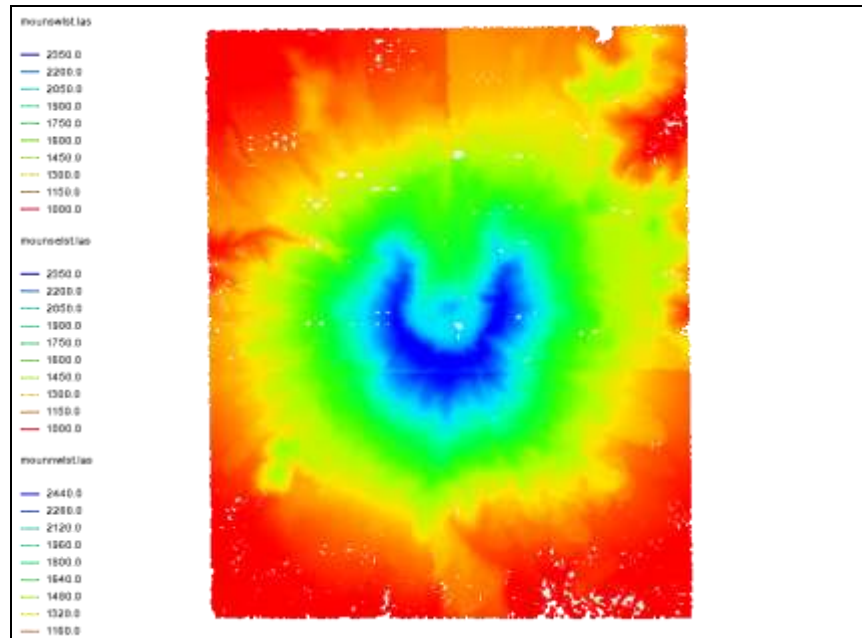


Figure 1 Mount St. Helens lidar files

Now change the perspective to be able to see the elevation more clearly.

6. Select *Display | View | Oblique*.

The project should now appear similar to Figure 2.

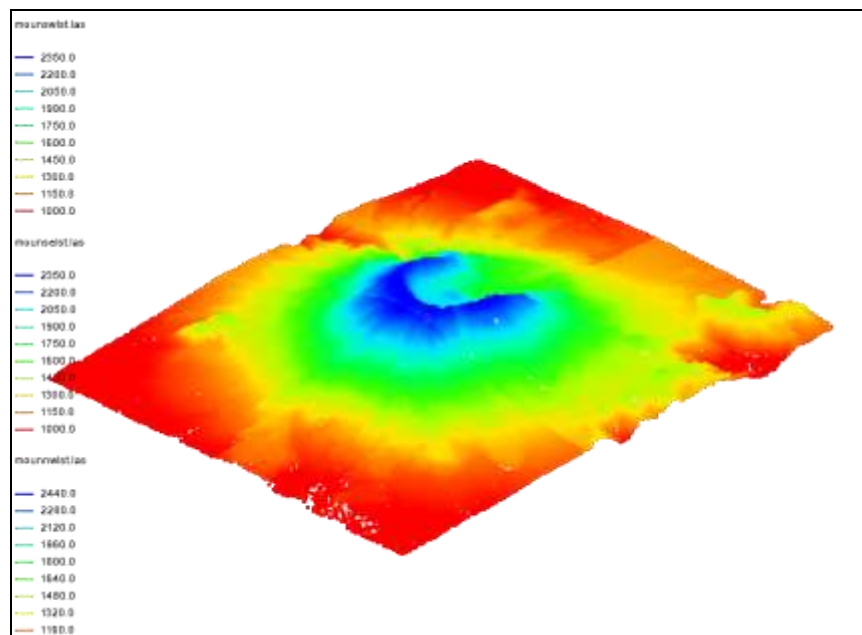


Figure 2 In oblique view

Now return the view to the top-down, or Plan view, by doing the following:

7. Click **Plan View** .

Notice that the edges of each lidar file can be discerned as a break in the color shading. This is a result of each lidar file having its own display options and thus its own

minimum and maximum data range used in the contour options. Setting the contour range to be the same for all the lidar files is one way to correct this. Merging the lidar files into one file, as demonstrated in the next section, is another way.

3 Merging Lidar Files

Multiple lidar files can be merged into one file. SMS creates a new lidar file that contains the data of all the individual files.


3.1 Exporting a Merged Lidar File

1. In the Project Explorer, select all four Mount St. Helens lidar files by selecting the first file then holding down the *Shift* key and selecting the last file.
2. Right-click on any of the selected files and select **Merge...** to open the *Lidar File* dialog.
3. Select “Lidar Compressed Files (*.laz)” from the *Save as type* drop-down.
4. Enter “all.laz” in the *File name* field and click **Save** to close the *Lidar File* dialog and create the merged lidar file.

It may take several seconds to create the merged file. The LAZ format is a compressed lidar format.

3.2 Importing a Merged Lidar File


Now to import the file that was just created:

1. Click **Open**  to bring up the *Open* dialog.
2. Select “All Files (*.*)” from the *Files of type* drop-down.
3. Select “all.laz” and click **Open** to exit the *Open* dialog and import the merged lidar file.
4. In the Project Explorer, turn off the original four LAS files.

Notice that the merged file appears sparser because only 50,000 points are being drawn to represent 23 million points. This could be changed by increasing the number of points displayed in the *Lidar Display Options* dialog.

Also notice that the coloration is now smooth with no sharp breaks. This is because there is only one minimum and maximum range used for contouring.

The rest of the tutorial will use the original four lidar files so the merged lidar file can be removed.

5. In the Project Explorer, right-click  “all.laz” and select **Remove**.
6. Click **Yes** if asked to confirm the deletion.
7. Turn on the four LAS files.

4 Converting Lidar to a Raster Using Multiple Files

A raster can be created from multiple lidar files. If the files overlap, the overlapping data will be averaged to get the raster values.

Convert all the lidar data to a raster by doing the following:

1. In the Project Explorer, select all four lidar files using the *Shift* key.
2. Right-click on any of the selected files and select *Interpolate to | Raster* to open the *Interpolate Lidar to Raster* dialog.
3. Click **OK** to accept the defaults and open the *Raster File* dialog.
4. Enter “all.tif” as the *File name* and click **Save** to close the *Raster File* dialog.
5. In the Project Explorer, turn off the original four LAS files.

The raster should appear similar to Figure 3.

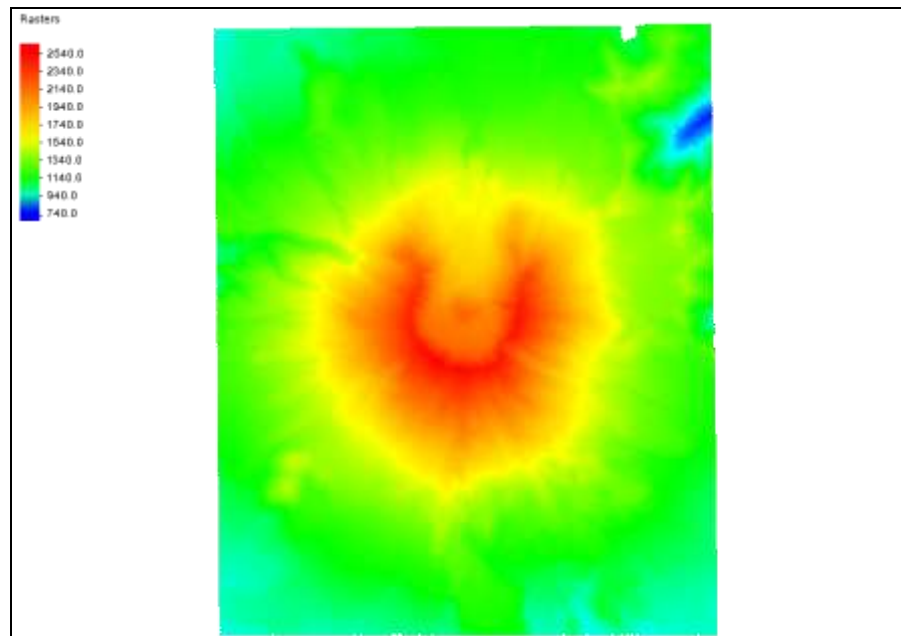


Figure 3 Raster converted from multiple lidar files


The rest of the tutorial does not use the raster file, so it can be deleted.

6. In the Project Explorer, right-click “all.tif” and select **Remove**.
7. Click **Yes** if asked to confirm the deletion.
8. Turn on “GIS Layers,” which turns on all of the lidar files.

5 Interpolate Lidar to a UGrid Using Multiple files



Multiple lidar files can be interpolated to a UGrid, much in the same way the raster was created. If the files overlap, the overlapped regions will be averaged to determine the data values.



Start with importing a 2D UGrid:

1. Click **Open**  to bring up the *Open* dialog.
2. Select “All Files (*.*)” from the *Files of type* drop-down.
3. Select “multipleLidar.vtu” and click **Open**.

This is a 2D grid that is in a location where a numerical model could be created.

4. Select all of the LAS files in the Project Explorer.
5. Right-click on any of the selected files and select *Interpolate to | UGrid* to open the *Interpolate Lidar to UGrid* dialog.
6. In the *Target dataset location* section, select *Points*.
7. Enter “all” as the *New dataset name*.
8. Click **OK** to close the *Interpolate Lidar to UGrid* dialog.

Once it is done processing, notice the new “ all” dataset under “ UGrid” in the Project Explorer. To see the interpolated values of the UGrid, turn on UGrid contours.

9. Click **Display Options**  to open the *Display Options* dialog.
10. Select “UGrid: multiple Lidar – [Active]” from the list on the left.
11. Turn on *Face Contours* and select the Options... button to open the *Dataset Contour Options – all* dialog.
12. In the *Contour method* section, select “Color Fill” from the first drop-down.
13. Click **OK** to close the *Dataset Contour Options – all* dialog.
14. Click **OK** to close the *Display Options* dialog.
15. Turn off “ GIS Data” in the Project Explorer.

The display should now appear similar to Figure 4.

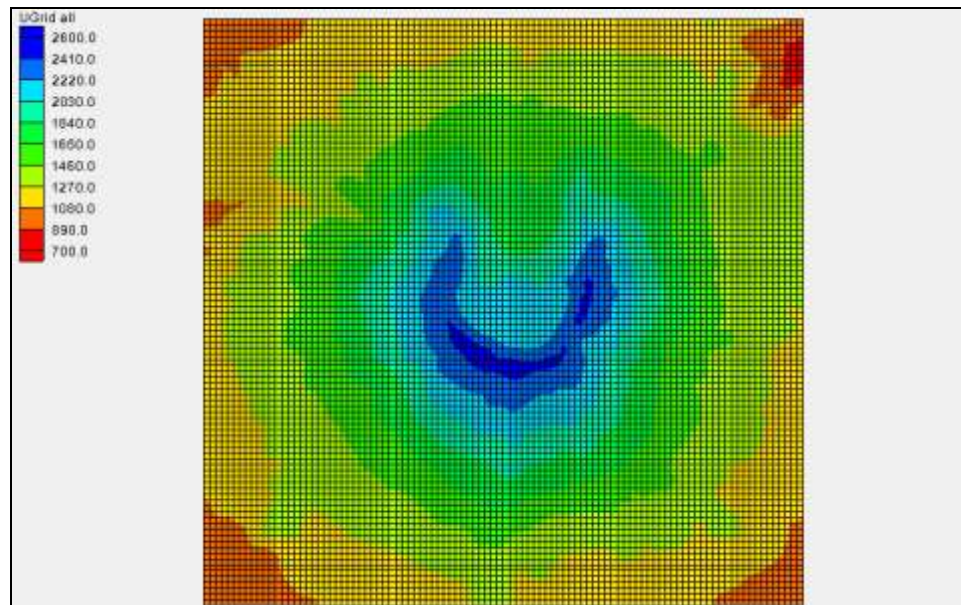


Figure 4 UGrid with interpolated values from multiple lidar.

6 Conclusion

This concludes the SMS “Lidar with Multiple Files” tutorial. The following topics were discussed and demonstrated:

- Multiple lidar can be displayed and used for interpolation to rasters and UGrids.
- SMS can merge multiple lidar files into a single lidar file.
- Lidar files each have their own display options.